



HAMPDEN-SYDNEY COLLEGE

Founded 1776

DEPARTMENT OF
PHYSICS & ASTRONOMY

ANALYSIS OF DATA FROM THE ENERGETIC GAMMA-RAY EXPERIMENT ON THE GAMMA RAY OBSERVATORY

NASA GRANT # NAG 5 1742

Semiannual Status Report No. 7

For the period August 15, 1994 through February 15, 1995

Principal Investigator

Donald A Kniffen

Prepared for

National Aeronautics and Space Administration

Goddard Space Flight Center

Greenbelt, MD 20771

Hampden-Sydney College
Department of Physics and Astronomy
Hampden-Sydney, Virginia 23943

INTERIM
MS 93-CR
630T
42744
P 12

N95-23216

Unclass

0042744

63/93

(NASA-CR-197347) ANALYSIS OF DATA
FROM THE ENERGETIC GAMMA-RAY
EXPERIMENT OF THE GAMMA RAY
OBSERVATORY Semiannual Status
Report No. 7, 15 Aug. 1994 - 15
Feb. 1995 (Hampden-Sydney Coll.)
12 p

ANALYSIS OF DATA FROM THE ENERGETIC GAMMA-RAY
EXPERIMENT TELESCOPE ON THE GAMMA RAY OBSERVATORY

NASA GRANT # NAG 5 1742

Principal Investigator: Donald A Kniffen

August 15, 1993 - February 15, 1995

RESEARCH REPORT

(1) SUMMARY

The work under the Grant has involved continued participation with the Compton Gamma Ray Observatory Energetic Gamma-Ray Experiment Telescope (EGRET) Team in the analysis of data obtained during instrument operations and the preparation of scientific papers and proposals for future observations. The Principal Investigator (PI) has been a co-author on a total of 66 papers published in refereed professional journals since the beginning of 1993, plus many other non-refereed publications, and contributed and invited papers at professional meetings and IAU telegrams. The EGRET team continues to submit IAU Astronomical telegrams and present many papers at scientific meetings. The EGRET Team was also successful on many proposals for the Cycle 4 portion of the mission, including long high galactic latitude studies of the diffuse extragalactic radiation in both the Northern and Southern Galactic Sky. These studies will be used in a effort to establish whether this radiation is truly diffuse or the sum of radiation from unresolved discrete sources such as radio-loud quasars. The Cycle 4 proposal include the EGRET Team, and Drs. Floyd Stecker, Mike Salamon and John Miller.

The effort by the PI has involved working remotely by internet connection on the Goddard Space Flight Center Computers where the EGRET data are archived. Students have monitored instrument performance, performed Viewing Period Analyses and analyzed data remotely and will continue to do so. The PI has completed the detailed analysis of ten viewing periods to search for point sources and this work has been used in developing the first and second EGRET catalog of sources, published in a Supplement to the **Astrophysical Journal**.

The only travel performed on this Grant activity in the last reporting period has been several trips to the Goddard Space Flight center for joint work with other EGRET Team members and for EGRET Team meetings. The latest of these was a 7-9 February 1995 meeting for the purpose of preparing Cycle 5 Guest Investigator Proposals. The

Principal Investigator is also the Principal Investigator on one of these proposals, the second Writer of another and Co-Investigator on several others.

Data analysis is complete for papers on behalf of the EGRET Team by the PI on general sources in the anticenter region of the galaxy, with galactic latitudes from 125° to 220° . A paper on this subject is in prepared for publication in the Astrophysical Journal. Another is being prepared on EGRET observations of the COS-B source 2CG135. Work is in progress for a third on the contribution of unresolved pulsars to the galactic diffuse radiations two toher papers are in analysis phase.

A number of papers have been published in the last reporting period, and several others are in press currently. A summary of the publications is attached below.

(2) PROGRESS

The progress of major efforts under this grant are given below:

- (a) The PI continues to participate in the preparation of many papers for publication in various journals for astronomy and astrophysics.
- (b) The PI will assisted in the preparation of proposal for the Cycle 5 Compton Observatory data and will be PI of a proposal entitled "Continued Investigation of the High Latitude Diffuse Gamma-Ray Emission."
- (c) The PI will continue to analyze a portion of the viewing periods for the presence of discrete source with student participation at Hampden-Sydney College.
- (d) The PI is preparing a paper describing the high energy sources observed by EGRET in the galactic plane region $25^\circ \leq \ell \leq 220^\circ$.
- (e) The PI is preparing a paper describing the EGRET high energy gamma-ray observations of the COS-B source 2CG135.
- (f.) The PI is participating in the preparation of a paper on the contribution of unresolved pulsars to the observed galactic diffuse gamma-radiation with Matthew Bailes and Joe Fierro.
- (f) The PI continues to attend EGRET Team Meetings as possible and works closely with the rest of the EGRET Team on data analysis.

(3) PUBLICATIONS

The following are articles co-authored by the PI which are related to this work and which have appeared in refereed journals since the inception of this Grant.

1992 "A High Frequency Survey of the Southern Galactic Plane for Pulsars", S. Johnston, A. G. Lyne, R. N. Manchester, D. A. Kniffen, N. D'Amico, J. Lim and M. Ashworth, Monthly Notices of the Royal Astronomical Society **255**, 401.

1992 "Detection of High Energy Gamma Radiation from Quasar 3C279 by the Egret Telescope on the Compton Gamma Ray Observatory, R. C. Hartman, D. L.

Bertsch, C. E. Fichtel, S. D. Hunter, G. Kanbach, D. A. Kniffen, P. W. Kwok, Y. C. Lin, J. R. Mattox, H. A. Mayer-Hasselwander, P. F. Michelson, C. von Montigny, H. I. Nel, P. L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, M. Sommer, P. Sreekumar, and D. J. Thompson, *Astrophys. J.* **385**, L1.

1992 "EGRET Detection of High Energy Gamma Rays from the May 3, 1991 Gamma-Ray Burst" E. J. Schneid, D. L. Bertsch, C. E. Fichtel, R. C. Hartman, S. D. Hunter, G. Kanbach, D. A. Kniffen, P. W. Kwok, Y. C. Lin, J. R. Mattox, H. A. Mayer-Hasselwander, P. F. Michelson, C. von Montigny, P. L. Nolan, K. Pinkau, H. Rothermel, M. Sommer, P. Sreekumar, and D. J. Thompson, *Astronomy and Astrophys* **255**, L13.

1992 "Galactic Gamma-Ray Emission from Radio Pulsars," M. Bailes and D. A. Kniffen, *Astrophys. J* **391**, 659.

1992 "Pulsed High Energy Gamma Radiation from Geminga (1E 0630+178)," D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P.L. Nolan, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar and D.J. Thompson, *Nature* **357**, 306.

1992 "Search for Periodic Gamma-Ray Emission from Cygnus X-3 by the EGRET Telescope on the Compton Gamma Ray Observatory," P.F. Michelson, D.L. Bertsch, J. Chiang, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, M. Sommer, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **401**, 724.

1992 "SAS-2 Observation of Pulsed High Energy Gamma Radiation from Geminga," J.R. Mattox, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, D.A. Kniffen, and D.J. Thompson, *Astrophys. J. Letters* **401**, L23.

1992 "Detection of High Energy Gamma-Ray Emission from the BL Lac Object MKN421 by the EGRET Telescope on the Compton Observatory," Y.C. Lin, D.L. Bertsch, J. Chiang, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **401**, L61.

1992 "EGRET Detection of High Energy Gamma Radiation from the OVV Quasar 3C454.3," R.C. Hartman, D.L. Bertsch, C.E. Fichtel, S.D. Hunter, G. Kanbach, P. Kwok, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. v. Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **401**, L61.

1992 "Pulsed High Energy Gamma Radiation from PSR 1706-44 (2CG342-02)," D.J. Thompson, Z. Arzoumanian, D.L. Bertsch, K.T.S. Brazier, N. D'Amico, C.E. Fichtel, J.M. Fierro, R.C. Hartman, S.D. Hunter, S. Johnston, G. Kanbach, V.M. Kaspi, D.A. Kniffen, Y.C. Lin, A.G. Lyne, R.N. Manchester, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. v. Montigny, H.I. Nel, D. Nice, P.L. Nolan, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar, J.H. Taylor, *Nature* **359**, 615.

1992 "Observations of the Large Magellanic Cloud in High Energy Gamma Rays," P. Sreekumar, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, E. Schneid, D.J. Thompson, *Astrophys. J.* **400**, L67.

1993 "Constraints on the Cosmic Rays in the Small Magellanic Cloud," P. Sreekumar, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P.L. Nolan, C. von Montigny, K. Pinkau, E. Schneid, D.J. Thompson, *Phys. Rev. Letters* **70**, 127.

1993 "The Compton Gamma Ray Observatory," N. Gehrels, E. Chipman, and D.A. Kniffen, *Astron. Astrophys. Suppl. Ser.* **97**, 5.

1993 "Overview of the First Egret Results," C.E. Fichtel, D.L. Bertsch, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar, D.J. Thompson, *Astron. Astrophys. Suppl. Ser.* **97**, 13.

1993 "Detection of High Energy Gamma Rays from Quasar 0528+134 by the EGRET Telescope on the Compton Gamma Ray Observatory," S.D. Hunter, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P. Moller, C. v. Montigny, P.L. Nolan, K. Pinkau, H.-D. Radecke, H. Rothermel, P. Shaver, E. Schneid, M. Sommer, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **409**, 134.

1993 "Detection of Gamma Ray Emission from the Quasar PKS 0208-512," D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. v. Montigny, P.L. Nolan, K. Pinkau, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J. Letters* **405**, L21.

1993 "EGRET Observations of 3C273," C. von Montigny, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, M. Sommer, P. Sreekumar, and D.J. Thompson, *Astron. and Astrophys. Suppl.* **97**, 101.

1993 "Detection of a Long-Duration Solar Gamma-Ray Flare on June 11, 1991 with EGRET of COMPTON-GRO," G. Kanbach, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, M. Sommer, P. Sreekumar, and D.J. Thompson, *Astron. and Astrophys.* **97**, 349.

1993 "EGRET Detection of High Energy Gamma Radiation from the OVV Quasar 3C454.3," R.C. Hartman, D.L. Bertsch, C.E. Fichtel, S.D. Hunter, G. Kanbach, P. Kwok, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. v.Montigny, P.L. Nolan, B.G. P50. 1993

1993 "Calibration of the Energetic Gamma Ray Experiment Telescope (EGRET) for the Compton Gamma Ray Observatory," D.J. Thompson, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, R. Hofstadter, E.B. Hughes, S.D. Hunter, B.W. Hughlock, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, C. v.Montigny, P.L. Nolan, H.I. Nel, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar, D. Tieger, and A.H. Walker, *Astrophys. J. Suppl.* **86**, 629.

1993 "Observation of the Crab Pulsar and Nebula by the EGRET Telescope on the *Compton* Gamma Ray Observatory," P.L. Nolan, Z. Arzoumanian, D.L. Bertsch, J. Chiang, C.E. Fichtel, J.M. Fierro, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, H.I. Nel, D. Nice, K. Pinkau, H. Rothermel, E. Schneid, M. Sommer, P. Sreekumar, J.H. Taylor, and D.J. Thompson, *Astrophys. J.* **409**, 697.

1993 "Detection of High Energy Gamma Rays from BL LAC PKS 0235+164 by the EGRET Telescope on the Compton Observatory," S.D. Hunter, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P. Moller, C. v.Montigny, P.L. Nolan, K. Pinkau, H.-D. Radecke, H. Rothermel, P. Shaver, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **410**, 87.

1993 "Pulsed High-Energy Gamma Rays from PSR 1055-52," J.M. Fierro, D.L. Bertsch, K.T.S. Brazier, J. Chiang, N. D'Amico, C.E. Fichtel, R.C. Hartman, S.D. Hunter, S. Johnston, G. Kanbach, V.M. Kaspi, D.A. Kniffen, Y.C. Lin, A.G. Lyne, R.N. Manchester, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, E. Schneid, and D.J. Thompson, *Astrophys. J.* **413**, L27.

1993 "Gamma Radiation from the Blazar PKS 0537-441," D.J. Thompson, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. v.Montigny, P.L. Nolan, K. Pinkau, E.J. Schneid, P. Sreekumar, *Astrophys. J.* (In prep)

1993 "The EGRET Detection of Quasar 1633+382," J.R. Mattox, D.L. Bertsch, J. Chiang, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **410**, 609.

1993 "Time Variability in the Gamma-Ray Emission of 3C 279," D.A. Kniffen, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **411**, 133.

1993 "EGRET Observations of Pulsars," D.A. Kniffen, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, J.R. Mattox, D.J. Thompson, K.T.S. Brazier, G. Kanbach, H.A. Mayer-Hasselwander, C. v. Montigny, K. Pinkau, J. Chiang, J.M. Fierro, Y.C. Lin, P.F. Michelson, P.L. Nolan, E. Schneid, H.I. Nel, P. Sreekumar, Z. Arzoumanian, V.M. Kaspi, D. Nice, J. Taylor, M. Bailes, S. Johnston, R.N. Manchester, A.G. Lyne, N. D'Amico, and L. Nicastro, *Proceedings of the Compton Centennial Symposium*, (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 177.

1993 "EGRET Observations of Gamma Ray Bursts," E.J. Schneid, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, M. Rothermel, M. Sommer, D.J. Thompson, *Proceedings of the Compton Centennial Symposium* (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 850.

1993 "EGRET Upper Limits for the Blazars 3C 345, BL LAC, and 3C 371," C. von Montigny, G. Kanbach, H.A. Mayer-Hasselwander, K. Pinkau, H. Rothermel, M. Sommer, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, J.R. Mattox, Y.C. Lin, P.F. Michelson, P.L. Nolan, D.A. Kniffen, E. Schneid, *Proceedings of the Compton Centennial Symposium* (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 518.

1993 "EGRET Observations of the Constellation Cygnus," J.R. Mattox, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, P. Sreekumar, D.J. Thompson, P.W. Kwok, K. Brazier, T. Halaczek, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, K. Pinkau, H.D. Radecke, H. Rothermel, M. Sommer, J. Fierro, Y.C. Lin, P.F. Michelson, P.L. Nolan, J. Chiang, D.A. Kniffen and E. Schneid, *Proceedings of the Compton Centennial Symposium* (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 365.

1993 "Preliminary EGRET Source Catalog," C.E. Fichtel, D.L. Bertsch, B.L. Dingus, R.C. Hartman, S.D. Hunter, P.W. Kwok, J.R. Mattox, P. Sreekumar, D.J. Thompson, D.A. Kniffen, Y.C. Lin, P.L. Nolan, P.F. Michelson, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, K. Pinkau, and E.J. Schneid, *Proceedings of the Compton Centennial Symposium* (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 1194.

1993 "EGRET Observations of Gamma-ray Bursts on June 1, 1991 and August 14, 1991," P.W. Kwok, D.L. Bertsch, D.J. Thompson, E.J. Schneid, B.L. Dingus, P. Sreekumar, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, K. Pinkau, H. Rothermel, M. Sommer, Y.C. Lin, P.F. Michelson, P.L. Nolan, D.A. Kniffen, and J.R. Mattox, Proceedings of the *Compton* Centennial Symposium (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 855.

1993 "High Energy Gamma-Ray Emission from Active Galactic Nuclei Observed by the Energetic Gamma-Ray Telescope Experiment (EGRET)," C.E. Fichtel, D.L. Bertsch, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P.L. Nolan, C. von Montigny, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar and D.J. Thompson, Proceedings of the *Compton* Centennial Symposium (Washington Univ, St. Louis), AIP Conference Proceedings **280**, 461.

1993 "Observations of High-Energy Gamma Rays from the Quasi-Stellar Object CTA 102," P.L. Nolan, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **414**, 82.

1993 "EGRET Observations of Active Galactic Nuclei: 0836+710, 0454-234, 0804+499, 906+430, 1510-089, and 2356+196," D.J. Thompson, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, and P. Sreekumar, *Astrophys. J. Letters* **415**, L13.

1993 "Results from the Energetic Gamma-Ray Experiment Telescope (EGRET) on the *Compton* Observatory," C.E. Fichtel, D.L. Bertsch, B. Dingus, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar, and D.J. Thompson, *Adv. Space. Res* **13**, no. 12, 637.

1993 "EGRET Observations of the June 30 and July 2, 1991 Energetic Solar Flares," B.L. Dingus, P. Sreekumar, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, S.D. Hunter, D.J. Thompson, E.J. Schneid, K.T.S. Barzier, G. Kanbach, C. von Montigny, H.A. Mayer-Hasselwander, Y.C. Lin, P.F. Michelson, P.L. Nolan, D.A. Kniffen, and J.R. Mattox, AIP Proceedings.

1994 "EGRET Observations of Active Galactic Nuclei," R.C. Hartman, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, S.D. Hunter, J.R. Mattox, P. Sreekumar, D.J. Thompson, D.A. Kniffen, E.J. Schneid, J. Chiang, J.M. Fierro, Y.C. Lin, P.F. Michelson, P.L. Nolan, T. Willis, G. Kanbach, H.A.

Mayer-Hasselwander, and C. von Montigny, 2nd *Compton* Symposium, to be published, AIP Proceedings **304**, 563.

1994 "Variability of EGRET Detected Active Galaxies and Acceleration Mechanisms," P.F. Michelson, J. Chiang, J.M. Fierro, Y.C. Lin, P.L. Nolan, T. Willis, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, J.R. Mattox, P. Sreekumar, D.J. Thompson, D.A. Kniffen, K. Barzier, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, and E. Schneid, 2nd *Compton* Symposium, to be published, AIP Proceedings **304**, 602.

1994 "The Unidentified Gamma-Ray Source GRO J1837+59," P.L. Nolan, J.M. Fierro, Y.C. Lin, P.F. Michelson, T.D. Willis, J. Chiang, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, J.R. Mattox, P. Sreekumar, D.J. Thompson, K. Barzier, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, H.D. Radecke, D.A. Kniffen, E. Schneid, 2nd *Compton* Symposium, to be published, AIP Proceedings **304**, 360 .

1994 "EGRET Observations of Mrk 421 in Phase 1 and Phase 2 of the Compton Observatory's Viewing Program - A Summary," Y.C. Lin, J. Chiang, P.F. Michelson, P.L. Nolan, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, J.R. Mattox, P. Sreekumar, D.J. Thompson, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, E. Schneid, D.A. Kniffen, 2nd *Compton* Symposium, to be published, AIP Proceedings **304**, 582

1994 "The Luminosity Function of EGRET Detected Gamma-Ray Loud Active Galactic Nuclei," J. Chiang, J.M. Fierro, Y.C. Lin, P.F. Michelson, P.L. Nolan, T.D. Willis, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, J.R. Mattox, P. Sreekumar, D.J. Thompson, K. Barzier, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, H.D. Radecke, D.A. Kniffen, E. Schneid, 2nd *Compton* Symposium, to be published, AIP Proceedings **304**, 654.

1994 "EGRET Data Reduction and Analysis," C.E. Fichtel, D.L. Bertsch, R. Hartman, S.D. Hunter, D.J. Thompson, B.L. Dingus, J. Esposito, P. Sreekumar, J.R. Mattox, G. Kanbach, H.A. Mayer-Hasselwander, C. von Montigny, D.A. Kniffen, J. Fierro, Y.C. Lin, P.F. Michelson, P.L. Nolan, E. Schneid, 2nd *Compton* Symposium, to be published, AIP Proceedings **304**, 721.

1993 "EGRET Limits on High-Energy Gamma-Ray Emission from X-Ray and Low-Energy Gamma-Ray-Selected Seyfert Galaxies," Y.C. Lin, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, E. Schneid, P. Sreekumar, and D.J. Thompson , *Astrophys. J.* **416**, L53.

1994 "High Energy Gamma Radiation from Geminga Observed by EGRET," H.A. Mayer-Hasselwander, D.L. Bertsch, K.T.S. Brazier, J. Chiang, C.E. Fichtel, J.M. Fierro, R.C. Hartman, S.D. Hunter, G. Kanbach, P.W. Kwok, D.A. Kniffen, Y.C. Lin, J.R. Mattox, P.F. Michelson, P.L. Nolan, K. Pinkau, H. Rothermel, E.J. Schneid, M. Sommer, P. Sreekumar, D.J. Thompson, and C. von Montigny, *Astrophys J* **421**, 276.

1994 "High-Energy Gamma Rays from the Intense 1993 January 31 Gamma-Ray Burst," M. Sommer, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, G.J. Fishman, A.K. Harding, R.C. Hartman, S.D. Hunter, K. Hurley, G. Kanbach, D.A. Kniffen, C. Kouveliotou, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **422**, L63.

1994 "EGRET Observations of Three Gamma Ray Bursts >30 MeV," B.L. Dingus, P. Sreekumar, E.J. Schneid, D.L. Bertsch, C.E. Fichtel, A.K. Harding, R.C. Hartman, S.D. Hunter, D.J. Thompson, J.R. Mattox, K. Hurley, D.A. Kniffen, G. Kanbach, H.A. Mayer-Hasselwander, M. Sommer, C. von Montigny, Y.C. Lin, P.F. Michelson, and P. L. Nolan, *Gamma-Ray Burst Workshop*, to be published, AIP Proceedings.

1994 "EGRET High-Energy Gamma-Ray Observations of AGN Spectra and Time Variability," D.J. Thompson, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, P. Sreekumar, J. Chiang, J.M. Fierro, Y.C. Lin, P.F. Michelson, P.L. Nolan, G. Kanbach, H.A. Mayer-Hasselwander, C. v. Montigny, H-D. Radecke, D.A. Kniffen, J.R. Mattox and E.J. Schneid, **Multi-Wavelength Continuum Emission of AGN**, Proceedings of IAU Symposium No. 159, Geneva, 1993 (ed. T. Courvoisier and A. Blecha), 49.

1994 "A Study of M31, M87, NGC 253, and M82 in High Energy Gamma Rays," P. Sreekumar, D.L. Bertsch, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, E.J. Schneid, and D.J. Thompson, *Astrophys. J.* **426**, 105.

1994 "The First Energetic Gamma-Ray Experiment Telescope (EGRET) Source Catalog," C.E. Fichtel, D.L. Bertsch, J. Chiang, B.L. Dingus, J.A. Espisoto, J.M. Fierro, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, L. McDonald, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, P. Sreekumar, M. Sommer, E.J. Schneid, D.J. Thompson, and T. Willis, *Astrophys. Suppl. J.* **94**, 551.

1994 "The *Compton* Gamma Ray Observatory," N. Gehrels, E. Chipman and D. Kniffen, *Astrophys. J. Suppl.* **92**, 351.

1994 "Upper Limits on the High-Energy Gamma-Ray Fluxes from PSR 1951+32 and 1509-58," K.T.S. Brazier, D.L. Bertsch, C.E. Fichtel, J.M. Fierro, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, H.I. Nel, P.L. Nolan, E. Schneid, P. Sreekumar, and D.J. Thompson, *MNRAS* **268**, 517.

1994 "EGRET Observations of the Vela Pulsar," G. Kanbach, Z. Arzoumanian, D.L. Bertsch, K.T.S. Brazier, J. Chiang, C.E. Fichtel, J.M. Fierro, R.C. Hartman, S.D. Hunter, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, H.I. Nel, D. Nice, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, M. Sommer, P. Sreekumar, J.H. Taylor, and D.J. Thompson, *Astron and Astrophys.* **289**, 855.

1994, "EGRET High Energy Gamma-Ray Pulsar Studies, Part 1: Young Spin Powered Pulsars," D.J. Thompson, Z. Arzoumanian, D.L. Bertsch, K.T.S. Brazier, J. Chiang, N. D'Amico, B.L. Dingus, J.A. Esposito, J.M. Fierro, C.E. Fichtel, R.C. Hartman, S.D. Hunter, S. Johnston, G. Kanbach, V.M. Kaspi, D.A. Kniffen, Y.C. Lin, A.G. Lyne, R.N. Manchester, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, H.I. Nel, D.J. Nice, P.L. Nolan, P.V. Ramanamurthy, S.L. Shemar, E. Schneid, P. Sreekumar, and J.H. Taylor, *Astrophys. J.*, **436**, 229.

1994, "Search for the Energetic Gamma Ray Experiment Telescope (EGRET) Data for High Energy Gamma Ray Microsecond Bursts," C.E. Fichtel, D.L. Bertsch, B.L. Dingus, J.A. Esposito, R.C. Hartman, S.D. Hunter, H.A. Mayer-Hasselwander, L. McDonald, P.F. Michelson, C. von Montigny, P.L. Nolan, E.J. Schneid, P. Sreekumar, and D.J. Thompson," *Astrophys. J.* **434**, 557.

1994, "Diffuse Gamma Rays of Galactic and Extragalactic Origin: Preliminary Results from EGRET," P. Sreekumar and D.A. Kniffen, *Proceedings of IAU Symposium #168: The Big Bang and Diffuse Radiations in Space*, ed. M. Kafatos, Kluwer, in press

1994, "EGRET Upper Limits to the High-Energy Gamma-Ray Emission from the Millisecond Pulsars in nearby Globular Clusters," P.F. Michelson, D.L. Bertsch, K. Brazier, J. Chiang, B.L. Dingus, C.E. Fichtel, J. Fierro, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, C. von Montigny, P.L. Nolan, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **435**, 218.

1994, "Detection of a g-ray burst of very long duration and very high energy," K. Hurley, B.L. Dingue, R. Mukherjee, P. Sreekumar, C. Kouveliotou, C. Meegan, G.J. Fishman, D. Band, L. Ford, D. Bertsch, T. Cline, C. Fichtel, R. Hartman, S. Hunter, D.J. Thompson, G. Kanbach, H. Mayer-Hasselwander, C. von Montigny, M. Sommer, Y. Lin, P. Nolan, P. Michelson, D. Kniffen, J. Mattox, E. Schneid, M. Boer, and M. Niel," *Nature* **372**, 652.

1995, "EGRET Detection of the Blazar PKS 0420-014," H.D. Radecke, D.L. Bertsch, B.L. Dingus, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, E. Schneid, and D.J. Thompson, *Astrophys. J.* **439**, 659.

1995, "High-Energy Gamma Ray Emission from Active Galaxies: EGRET Observations and their Implications" C. von Montigny, D.L. Bertsch, J. Chiang, B.L. Dingus, J.A. Espisito, C.E. Fichtel, J.M. Fierro, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, P.L. Nolan, H.D. Radecke, E. Schneid, P. Sreekumar, D.J. Thompson, and T. Willis, *Astrophys. J.*, **440**, 525.

1995, "On the Nature of the Unidentified EGRET Sources: Are They Geminga-Like Pulsars?," R. Mukherjee, D.L. Bertsch, B.L. Dingus, G. Kanbach, D.A. Kniffen, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* (In Press).

1995, "R. Mukherjee, H.D. Aller, M.F. Aller, D.L. Bertsch, W. Collmar, S.W. Digel, B.L. Dingus, J.A. Esposito, C.E. Fichtel, R.C. Hartman, S.D. Hunter, W.N. Johnson, G. Kanbach, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, P.V. Ramanamurthy, E. Schneid, P. Sreekumar, H. Terasranta, D.J. Thompson, and S.J. Wagner, *Astrophys. J.* (In Press).

(4) PLANNED ACTIVITIES

In the coming period, several publications will be completed, the PI will continue to analyze EGRET data and viewing periods, and frequent visits will be made to the GSFC for collaboration with the EGRET Co-Investigators. Four papers, currently in progress, on EGRET results will be completed and submitted for publication. A Cycle 5 proposal to the *Compton* Observatory Guest Investigator Program will be prepared and submitted on behalf of the EGRET Team. The GSFC EGRET team will be supported in data reduction and operations activities, and EGRET Team meetings will be attended. Scientific results will be presented at future scientific meetings.